* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] Ring-like wet paper friction material which is equipped with the band of the shape of two or more ring where composition differs in the direction of a path in ring-like wet paper friction material, and is characterized by forming two or more aforementioned bands in one.
[Claim 2] Ring-like wet paper friction material of a claim 1 by which there are at least two aforementioned bands and many aramid pulp is blended with the periphery band as compared with the inner circumference band.
[Claim 3] Ring-like wet paper friction material of a claim 2 with the three aforementioned bands.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention belongs to the technical field of the wet paper friction material used for a gear change clutch, a lock-up clutch, etc. of the automatic transmission for vehicles, the automatic transmission for ******, and the change gear for motor bicycles.
[0002]
[Description of the Prior Art] From the former, the paper friction material which makes paper a base material is used as wet friction material. This paper friction material adds a paper-making chemical, after distributing a filler pulp (cellulose fiber etc.) and organic [various kinds of], or inorganic etc. underwater. the paper machine (it does not illustrate --) equipped with filters, such as a wire gauze, for the paper-making raw material changed into a certain state where grade condensation was carried out Resins for combination, such as phenol resin, are infiltrated into the sheet-like moldings which supplied, is made to accumulate, was squeezed, dehydrated and dried and was obtained, and it is stiffened.
[0003] The friction plate which the wet friction material used for a clutch pierces the paper friction material of the shape of an above sheet in the shape of a ring, and constitutes a clutch pastes up the friction material of the shape of this ring on both sides or one side of ring-like steel rodding.
[0004] Since a friction property is good and a low cost, although the paper friction material which makes such paper a base material is used as various kinds of wet friction material, even if a big load is applied by increase of an engine output etc., it excels in endurance and to be the thing of stable coefficient of friction is demanded.
[0005] In the clutch which used such ring-like friction material, if a friction plate and the steel separator plate which is a partner board are made to carry out pressurization engagement by the piston in case an engine output is transmitted to a wheel, since it has the composition that the periphery side of a friction plate is strongly pressed to a snap ring through an end plate, the contact pressure by the side of the periphery of both plates becomes large as compared with an inner circumference side. Therefore, the frictional heat generated in the periphery side of ring-like friction material is larger than an inner circumference side, and since degradation by the side of a periphery becomes early by the pyrolysis, when the number of times of engagement increases, it has the problem that coefficient of friction falls. There are some which are going to change the density and the porosity of friction material from the periphery section of ring-like friction material to JP,8-233004,A and JP,9-210177,A toward the inner circumference section like the friction material of a publication, and the difference of the degradation advance by the side of inner circumference and a periphery tends to be canceled [some], and are going to stabilize coefficient of friction from the former to such a problem.
[0006] However, since the above-mentioned friction material is single composition which makes cellulose fiber a major component, when it is used under heavy load conditions which the frictional heat exceeding the pyrolysis temperature of cellulose fiber generates, if the number of times of engagement increases, the whole friction material will deteriorate and coefficient of friction will fall.
[0007] Then, in order to prevent degradation of the whole friction material by the pyrolysis under a heavy load condition, there are some which blended aramid pulp with high pyrolysis temperature with the whole friction material in the case of paper making.
[0008]

[Problem(s) to be Solved by the Invention] However, since aramid pulp is expensive, what blended aramid pulp with the whole friction material has the problem that material cost becomes high.
[0009]
[Means for Solving the Problem] In ring-like wet paper friction material, this invention was equipped with the band of the shape of two or more ring where composition differs in the direction of a path, and solved the aforementioned technical problem by the ring-like wet paper friction material by which two or more aforementioned bands are formed in one.
[0010]
[Function] In this invention, since material composition of ring-like friction material can be changed in the direction of a path, the endurance of friction material can be raised as a whole as composition which excelled the inner circumference side in thermal resistance relatively in the periphery side which high frictional heat generates as compared with an inner circumference side.
[0011]
[Embodiments of the Invention] It is the expansion perspective diagram which drawing 1 showed the ring-like wet paper friction material 10 of this invention, drawing 1 (a) took out a part of friction material 10 in order that the perspective diagram of the friction plate F which made this ring-like paper friction material 10 fix, and drawing 1 (b) might explain the composition of the ring-like paper friction material 10 which fixed to the friction plate F of drawing 1 (a), and was shown typically. The ring-like paper friction material 10 of this invention is equipped with three composition bands, inner circumference band 10a, inside periphery band 10b, and periphery band 10c, as shown in drawing 1 (b).
[0012] Next, according to drawing 2 and drawing 3 , it explains how the ring-like wet paper friction material 10 of this invention is manufactured in one. Drawing 2 is the side elevation of the ring paper machine 20 for manufacturing the paper friction material 10 of this invention. Although the outline of the paper-making method by this ring paper machine 20 is the same as that of the conventional paper-making method, it is formed in the shape of a ring with this paper machine 20 to friction material being formed in the shape of [long] a sheet in the conventional paper machine. Therefore, it is not necessary to pierce the sheet after paper making in the shape of a ring like the conventional thing.
[0013] This ring paper machine 20 becomes the lauter tub 30 of the shape of a cylinder equipped with the filter 32 which filters a paper-making raw material, and this lauter tub 30 from two or more stirring supply tubs 40a, 40b, and 40c which supply a paper-making raw material. Drawing 3 is drawing of longitudinal section of the lauter tub 30 in the ring paper machine 20 of drawing 2 . Lauter tub 30 inferior surface of tongue is equipped with the filters 32, such as a wire gauze, and the downward portion is connected with the exhaust port 50 from the filter 32. The lauter tub 30 interior is divided into three space 36a, 36b, and 36c by the guide pipes 34a and 34b of this heart from which a path differs, and Funnels 38a, 38b, and 38c are attached in the upper part of each space 36a, 36b, and 36c. The guide pipes 34a and 34b which divide each space are movable up and down, and the about 5-7mm path clearance CL is left behind between guide pipes 34a and 34b and the filter 32.
[0014] In each stirring supply tubs 40a and 40b and 40c, the paper-making raw material with which components differ is supplied, and it always stirs with the agitator 42. Each space 36a, 36b, and 36c in each stirring supply tubs 40a, 40b, and 40c and the lauter tub 30 corresponding to this is connected by the tube 60, respectively, and each stirring supply tubs 40a and 40b and the paper-making raw material in 40c are supplied to each space 36a, 36b, and 36c in a lauter tub 30 through the funnels 38a, 38b, and 38c formed in the lauter tub 30 upper part.
[0015] When the path clearance CL formed between the guide pipes 34a and 34b in a lauter tub 30 and the filter 32 is too large, in the portion of path clearance CL, the flow between bands of an parallel paper-making raw material arises to a filter 32, and it stops becoming the composition from which a paper-making raw material is mixed with between adjoining bands, consequently ring-like friction material differs in the direction of a path. On the contrary, if path clearance CL is too small, since a filter 32 will be contacted the end face of guide pipes 34a and 34b closely, the deposit of the boundary portion of each circumferential band may turn into a thin layer, consequently a crack may arise in ring-like friction material.
[0016] The paper-making raw material with which the components supplied to it in the paper machine 20 of drawing 2 in each space 36a, 36b, and 36c in a lauter tub 30 when the 5-7mm path clearance CL

was left behind between guide pipes 34a and 34b and the filter 32 differ was deposited on the filter 32 in the state where it was mixed slightly on the boundary of each circumferential band, and continued, and it turns out that a satisfying result is obtained.
[0017] As [after drying the above-mentioned sediment] usual, after infiltrating thermosetting resin into ring-like friction material, heating and carrying out a heat-curing reaction, the ring-like friction material 10 of this invention was obtained by carrying out pressing. Drawing 4 is the front view of the ring-like friction material 10 of the above-mentioned this invention, and is equipped with three different bands in the direction of a path which consists of inner circumference band 10a, inside periphery band 10b, and periphery band 10c. When an example of the concrete size of the ring-like friction material of this invention is given, for the diameter of 130mm and an inside periphery, the diameter of 111mm and inner circumference is [the diameter of the outermost periphery / the diameter of 95mm and the most inner circumference] 81mm.
[0018] Five kinds of composition is shown in Table 1 as an example of composition of friction material, and Table 2 shows the friction material as which composition of inner circumference, an inside periphery, and a periphery was chosen from each composition shown in Table 1.
[Table 1]

摩擦材の組成の種類

	ペーパーの組成 (mass%)				ペーパーの秤量 (g/m²)
	ｾﾙﾛｰｽﾊﾟﾙﾌﾟ	ｹｲ藻土	ｱﾗﾐﾄﾞﾊﾟﾙﾌﾟ	ｸﾞﾗﾌｧｲﾄ	
A	50	40	0	10	240
B	50	40	0	10	210
C	50	40	0	10	180
D	35	40	15	10	210
E	20	40	30	10	210

[Table 2]

摩擦材の組成

径方向の位置	内周帯域	中周帯域	外周帯域
本発明の摩擦材	B	D	E
比較例1	B	B	B
比較例2	A	B	C

The friction material of this invention covering the whole from Table 2, and not containing aramid pulp in an inner circumference band, but applying to a periphery band from an inside periphery band, and making the content of aramid pulp increase gradually, although density is fixed understands.
[0019] On the other hand, although the example 2 of comparison covers the whole and is the same so that the whole may be covered and density and composition may become the same, the example 1 of comparison is manufactured using the above-mentioned ring paper machine 20 so that the density by the side of inner circumference may become larger than a periphery side. [of composition] In addition, in the case of the example 1 of comparison, it is not necessary to form the guide pipes 34a and 34b which separate the inside of a lauter tub 30 in the case of paper making. Moreover, although the example 2 of comparison supplies the paper-making raw material of the same composition to three space 36a, 36b, and 36c separated by the guide pipes 34a and 34b in a lauter tub 30, the amount of supply of the paper-

making raw material to each space 36a, 36b, and 36c differs. That is, supply to space 36a by the side of inner circumference mostly, apply to periphery side space 36c from inside periphery side space 36b, decrease the amount of supply gradually, and it is made for the alimentation of the paper-making raw material deposited on a filter 32 by the band to differ, and although it is the same composition as a whole when it compresses and this is dehydrated and dried so that it may become the same thickness, the friction material from which density differs by the band is obtained.

[0020] Drawing 5 shows aging of coefficient of friction of each friction material in the durability test under the heavy load conditions performed using the friction plate which made each above-mentioned friction material fix. a in drawing shows the test result about that for which the friction material of this invention and b used the example 1 of comparison of Table 2 for, and c used the example 2 of comparison of Table 2. In addition, after the friction plate in this case infiltrates phenol resin into each friction material of Table 2 chosen from each composition of Table 1 so that the amount of sinking in may become 40%, and it carries out a heat-curing reaction, the thickness of friction material makes rodding fix it by 0.4mm. Drawing 4 shows coefficient of friction not changing a lot and excelling in endurance, even if the number of times of engagement of friction material of this invention increases.

[0021] Of course, as friction material of this invention, you may constitute combining the composition of those other than above table 1.

[0022]

[Effect of the Invention] As mentioned above, the ring-like wet paper friction material of this invention does so the effect of equipping the bottom of a heavy load condition with high endurance. Moreover, since pyrolysis temperature can blend high aramid pulp only with a periphery side from a periphery side as compared with cellulose pulp etc. while high frictional heat occurs, material cost can be reduced.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention belongs to the technical field of the wet paper friction material used for a gear change clutch, a lock-up clutch, etc. of the automatic transmission for vehicles, the automatic transmission for ******, and the change gear for motor bicycles.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] From the former, the paper friction material which makes paper a base material is used as wet friction material. This paper friction material adds a paper-making chemical, after distributing a filler pulp (cellulose fiber etc.) and organic [various kinds of], or inorganic etc. underwater. Resins for combination, such as phenol resin, are infiltrated into the sheet-like moldings which the paper machine (not shown) equipped with filters, such as a wire gauze, was made to supply and deposit the paper-making raw material changed into a certain state where grade condensation was carried out, was squeezed, dehydrated and dried, and was obtained, and it is stiffened.

[0003] The friction plate which the wet friction material used for a clutch pierces the paper friction material of the shape of an above sheet in the shape of a ring, and constitutes a clutch pastes up the friction material of the shape of this ring on both sides or one side of ring-like steel rodding.

[0004] Since a friction property is good and a low cost, although the paper friction material which makes such paper a base material is used as various kinds of wet friction material, even if a big load is applied by increase of an engine output etc., it excels in endurance and to be the thing of stable coefficient of friction is demanded.

[0005] In the clutch which used such ring-like friction material, if a friction plate and the steel separator plate which is a partner board are made to carry out pressurization engagement by the piston in case an engine output is transmitted to a wheel, since it has the composition that the periphery side of a friction plate is strongly pressed to a snap ring through an end plate, the contact pressure by the side of the periphery of both plates becomes large as compared with an inner circumference side. Therefore, the frictional heat generated in the periphery side of ring-like friction material is larger than an inner circumference side, and since degradation by the side of a periphery becomes early by the pyrolysis, when the number of times of engagement increases, it has the problem that coefficient of friction falls. There are some which are going to change the density and the porosity of friction material from the periphery section of ring-like friction material to JP,8-233004,A and JP,9-210177,A toward the inner circumference section like the friction material of a publication, and the difference of the degradation advance by the side of inner circumference and a periphery tends to be canceled [some], and are going to stabilize coefficient of friction from the former to such a problem.

[0006] However, since the above-mentioned friction material is single composition which makes cellulose fiber a major component, when it is used under heavy load conditions which the frictional heat exceeding the pyrolysis temperature of cellulose fiber generates, if the number of times of engagement increases, the whole friction material will deteriorate and coefficient of friction will fall.

[0007] Then, in order to prevent degradation of the whole friction material by the pyrolysis under a heavy load condition, there are some which blended aramid pulp with high pyrolysis temperature with the whole friction material in the case of paper making.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, the ring-like wet paper friction material of this invention does so the effect of equipping the bottom of a heavy load condition with high endurance. Moreover, since pyrolysis temperature can blend high aramid pulp only with a periphery side from a periphery side as compared with cellulose pulp etc. while high frictional heat occurs, material cost can be reduced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since aramid pulp is expensive, what blended aramid pulp with the whole friction material has the problem that material cost becomes high.

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MEANS

[Means for Solving the Problem] In ring-like wet paper friction material, this invention was equipped with the band of the shape of two or more ring where composition differs in the direction of a path, and solved the aforementioned technical problem by the ring-like wet paper friction material by which two or more aforementioned bands are formed in one.

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OPERATION

[Function] In this invention, since material composition of ring-like friction material can be changed in the direction of a path, the endurance of friction material can be raised as a whole as composition which excelled the inner circumference side in thermal resistance relatively in the periphery side which high frictional heat generates as compared with an inner circumference side.
[0011]
[Embodiments of the Invention] It is the expansion perspective diagram which drawing 1 showed the ring-like wet paper friction material 10 of this invention, drawing 1 (a) took out a part of friction material 10 in order that the perspective diagram of the friction plate F which made this ring-like paper friction material 10 fix, and drawing 1 (b) might explain the composition of the ring-like paper friction material 10 which fixed to the friction plate F of drawing 1 (a), and was shown typically. The ring-like paper friction material 10 of this invention is equipped with three composition bands, inner circumference band 10a, inside periphery band 10b, and periphery band 10c, as shown in drawing 1 (b).
[0012] Next, according to drawing 2 and drawing 3 , it explains how the ring-like wet paper friction material 10 of this invention is manufactured in one. Drawing 2 is the side elevation of the ring paper machine 20 for manufacturing the paper friction material 10 of this invention. Although the outline of the paper-making method by this ring paper machine 20 is the same as that of the conventional paper-making method, it is formed in the shape of a ring with this paper machine 20 to friction material being formed in the shape of [long] a sheet in the conventional paper machine. Therefore, it is not necessary to pierce the sheet after paper making in the shape of a ring like the conventional thing.
[0013] This ring paper machine 20 becomes the lauter tub 30 of the shape of a cylinder equipped with the filter 32 which filters a paper-making raw material, and this lauter tub 30 from two or more stirring supply tubs 40a, 40b, and 40c which supply a paper-making raw material. Drawing 3 is drawing of longitudinal section of the lauter tub 30 in the ring paper machine 20 of drawing 2 . Lauter tub 30 inferior surface of tongue is equipped with the filters 32, such as a wire gauze, and the downward portion is connected with the exhaust port 50 from the filter 32. The lauter tub 30 interior is divided into three space 36a, 36b, and 36c by the guide pipes 34a and 34b of this heart from which a path differs, and Funnels 38a, 38b, and 38c are attached in the upper part of each space 36a, 36b, and 36c. The guide pipes 34a and 34b which divide each space are movable up and down, and the about 5-7mm path clearance CL is left behind between guide pipes 34a and 34b and the filter 32.
[0014] In each stirring supply tubs 40a and 40b and 40c, the paper-making raw material with which components differ is supplied, and it always stirs with the agitator 42. Each space 36a, 36b, and 36c in each stirring supply tubs 40a, 40b, and 40c and the lauter tub 30 corresponding to this is connected by the tube 60, respectively, and each stirring supply tubs 40a and 40b and the paper-making raw material in 40c are supplied to each space 36a, 36b, and 36c in a lauter tub 30 through the funnels 38a, 38b, and 38c formed in the lauter tub 30 upper part.
[0015] When the path clearance CL formed between the guide pipes 34a and 34b in a lauter tub 30 and the filter 32 is too large, in the portion of path clearance CL, the flow between bands of an parallel paper-making raw material arises to a filter 32, and it stops becoming the composition from which a paper-making raw material is mixed with between adjoining bands, consequently ring-like friction material differs in the direction of a path. On the contrary, if path clearance CL is too small, since a filter 32 will be contacted the end face of guide pipes 34a and 34b closely, the deposit of the boundary portion

of each circumferential band may turn into a thin layer, consequently a crack may arise in ring-like friction material.
[0016] The paper-making raw material with which the components supplied to it in the paper machine 20 of drawing 2 in each space 36a, 36b, and 36c in a lauter tub 30 when the 5-7mm path clearance CL was left behind between guide pipes 34a and 34b and the filter 32 differ was deposited on the filter 32 in the state where it was mixed slightly on the boundary of each circumferential band, and continued, and it turns out that a satisfying result is obtained.
[0017] As [after drying the above-mentioned sediment] usual, after infiltrating thermosetting resin into ring-like friction material, heating and carrying out a heat-curing reaction, the ring-like friction material 10 of this invention was obtained by carrying out pressing. Drawing 4 is the front view of the ring-like friction material 10 of the above-mentioned this invention, and is equipped with three different bands in the direction of a path which consists of inner circumference band 10a, inside periphery band 10b, and periphery band 10c. When an example of the concrete size of the ring-like friction material of this invention is given, for the diameter of 130mm and an inside periphery, the diameter of 111mm and inner circumference is [the diameter of the outermost periphery / the diameter of 95mm and the most inner circumference] 81mm.
[0018] Five kinds of composition is shown in Table 1 as an example of composition of friction material, and Table 2 shows the friction material as which composition of inner circumference, an inside periphery, and a periphery was chosen from each composition shown in Table 1.
[Table 1]

摩擦材の組成の種類

	ペーパーの組成 (mass%)				ペーパーの秤量 (g/m^2)
	ｾﾙﾛｰｽﾊﾟﾙﾌﾟ	けい藻土	ｱﾗﾐﾄﾞﾊﾟﾙﾌﾟ	ｸﾞﾗﾌｧｲﾄ	
A	50	40	0	10	240
B	50	40	0	10	210
C	50	40	0	10	180
D	35	40	15	10	210
E	20	40	30	10	210

[Table 2]

摩擦材の組成

径方向の位置	内周帯域	中間帯域	外周帯域
本発明の摩擦材	B	D	E
比較例1	B	B	B
比較例2	A	B	C

The friction material of this invention covering the whole from Table 2, and not containing aramid pulp in an inner circumference band, but applying to a periphery band from an inside periphery band, and making the content of aramid pulp increase gradually, although density is fixed understands.
[0019] On the other hand, although the example 2 of comparison covers the whole and is the same so that the whole may be covered and density and composition may become the same, the example 1 of comparison is manufactured using the above-mentioned ring paper machine 20 so that the density by the side of inner circumference may become larger than a periphery side. [of composition] In addition, in

the case of the example 1 of comparison, it is not necessary to form the guide pipes 34a and 34b which separate the inside of a lauter tub 30 in the case of paper making. Moreover, although the example 2 of comparison supplies the paper-making raw material of the same composition to three space 36a, 36b, and 36c separated by the guide pipes 34a and 34b in a lauter tub 30, the amount of supply of the paper-making raw material to each space 36a, 36b, and 36c differs. That is, supply to space 36a by the side of inner circumference mostly, apply to periphery side space 36c from inside periphery side space 36b, decrease the amount of supply gradually, and it is made for the alimentation of the paper-making raw material deposited on a filter 32 by the band to differ, and although it is the same composition as a whole when it compresses and this is dehydrated and dried so that it may become the same thickness, the friction material from which density differs by the band is obtained.

[0020] Drawing 5 shows aging of coefficient of friction of each friction material in the durability test under the heavy load conditions performed using the friction plate which made each above-mentioned friction material fix. a in drawing shows the test result about that for which the friction material of this invention and b used the example 1 of comparison of Table 2 for, and c used the example 2 of comparison of Table 2. In addition, after the friction plate in this case infiltrates phenol resin into each friction material of Table 2 chosen from each composition of Table 1 so that the amount of sinking in may become 40%, and it carries out a heat-curing reaction, the thickness of friction material makes rodding fix it by 0.4mm. Drawing 4 shows coefficient of friction not changing a lot and excelling in endurance, even if the number of times of engagement of friction material of this invention increases.

[0021] Of course, as friction material of this invention, you may constitute combining the composition of those other than above table 1.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the expansion perspective diagram in which the perspective diagram of the friction plate which drawing 1 (a) made fix this friction material, and drawing 1 (b) took out a part of friction material of drawing 1 (a), and showed it typically by showing the ring-like wet paper friction material of this invention.
[Drawing 2] The side elevation of the ring-like paper machine for manufacturing the ring-like wet paper friction material of this invention.
[Drawing 3] Drawing of longitudinal section of the lauter tub in the ring-like paper machine of drawing 2 .
[Drawing 4] Front view of the ring-like wet paper friction material of this invention.
[Drawing 5] The durability test result under the heavy load conditions of the clutch plate which made friction material fix.
[Description of Notations]
10: Ring-like paper friction material
10a: Inner circumference band
10b: Inside periphery band
10c: Periphery band

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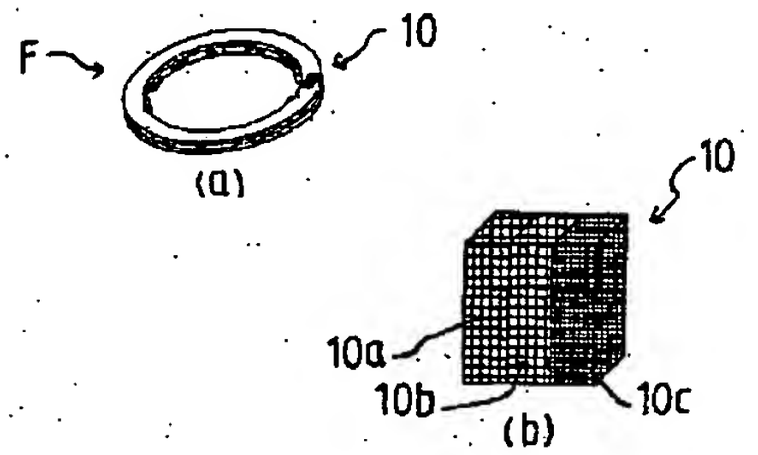
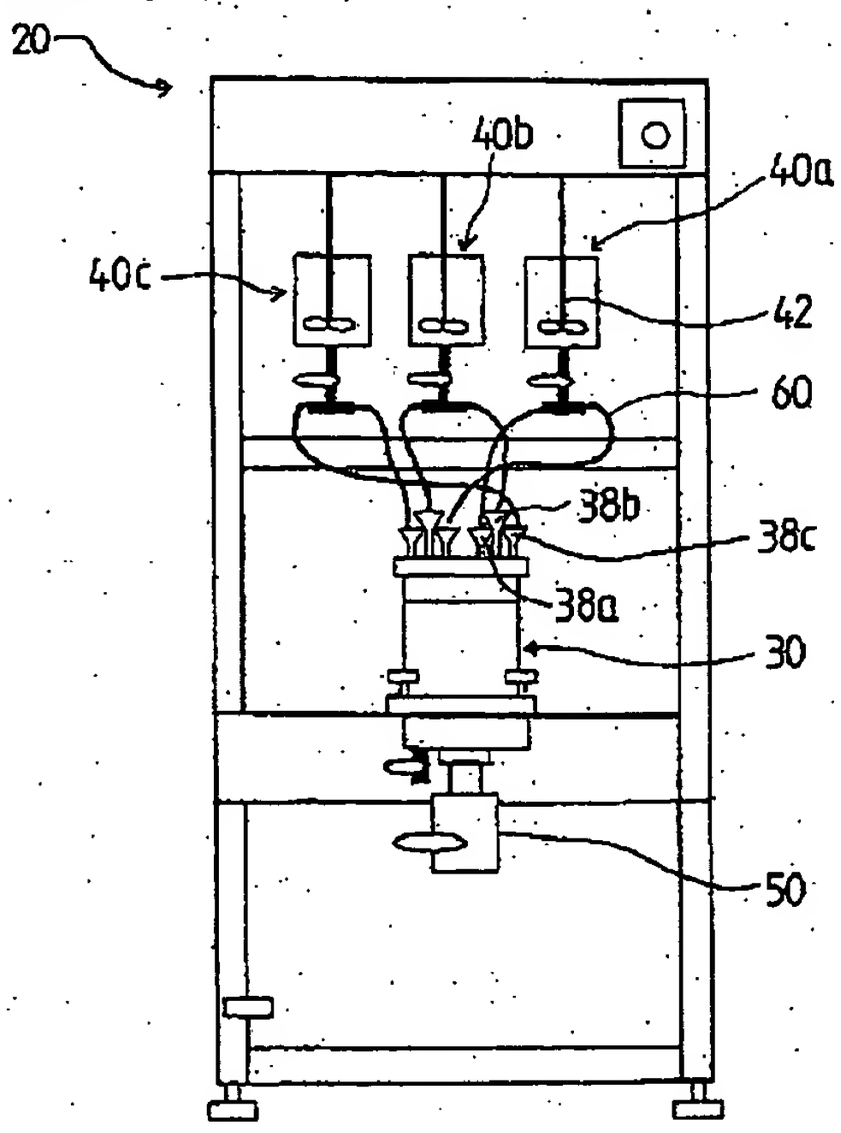
DRAWINGS

[Drawing 1]



[Drawing 2]



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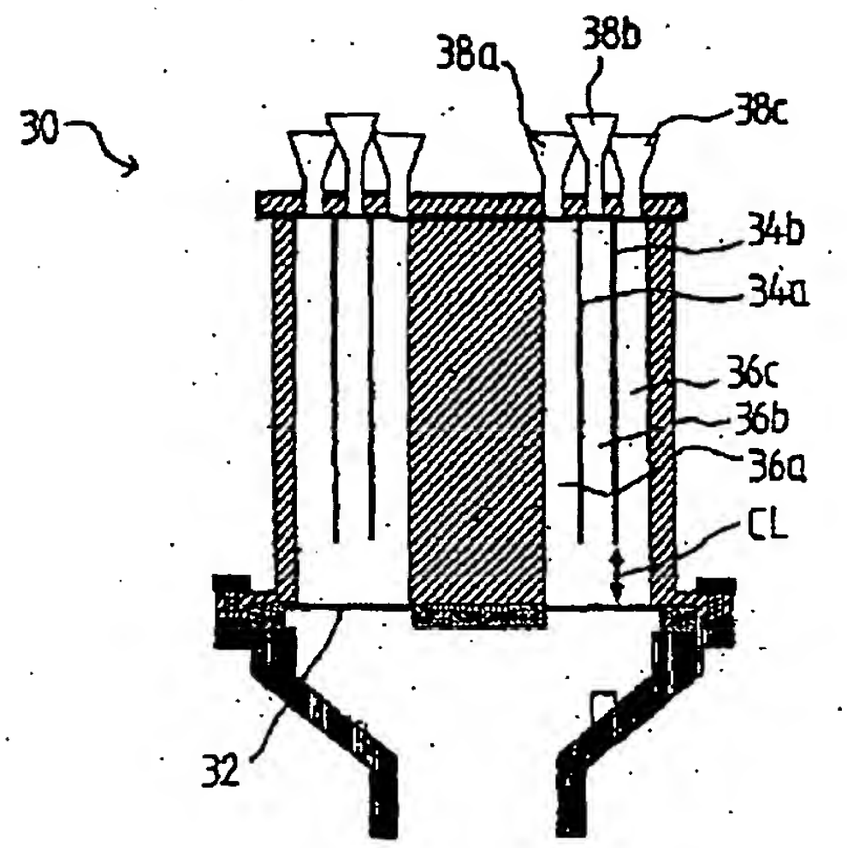
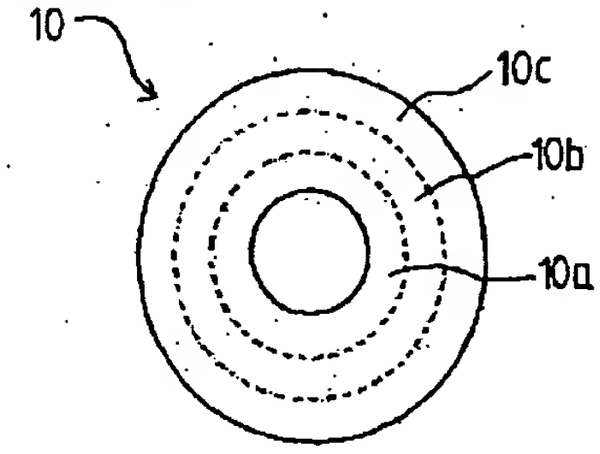
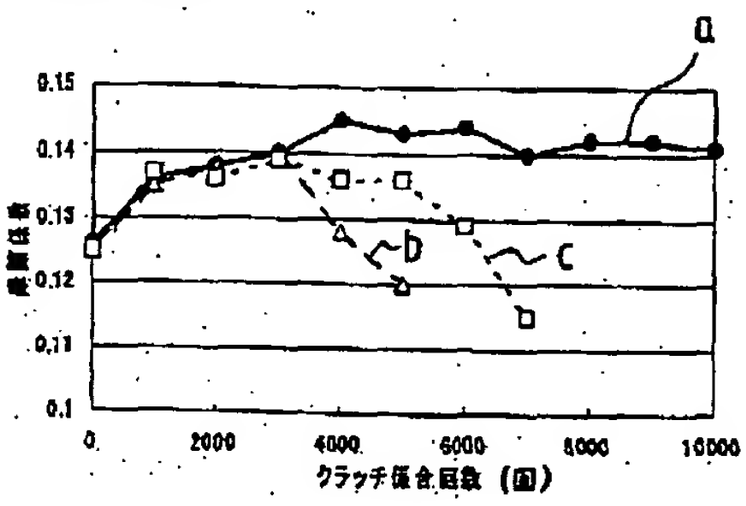


[Drawing 4]



[Drawing 5]



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